

June 1999

CURRICULUM VITAE

NAME: Nancy Chyan Huei Lo
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ORGANIZATION: National Oceanic & Atmospheric Administration+
National Marine Fisheries Service
Southwest Fisheries Science Center
P.O. Box 271
La Jolla, California 92038

PRESENT POSITION: Mathematical statistician

DISCIPLINE: Statistics and Mathematics

EDUCATION:

B.S. Business Administration, National Taiwan University, 1964

M.S., Statistics, Oregon State University, 1968

Ph.D., Statistics, Oregon State University, 1972

EXPERIENCE:

1980 - present Mathematical Statistician
Coastal Fisheries Resources Division
National Marine Fisheries Service
La Jolla, California

1998 - 1999 Adjunct Professor
Department of Mathematical Science
San Diego State University

1990 - present	Visiting Professorship Centro Interdisciplinario de Ciencias Marinas La Paz BCS, Mexico
Feb - May 1986	Visiting Professorship National Taiwan College of Marine Science & Tech. Taiwan, ROC.
1976 - 1980	Mathematical Statistician Porpoise and Tuna Interaction Program, OFRD National Marine Fisheries Service La Jolla, California
1972 - 1976	Statistical Method Analyst California Dept. of Fish and Game Menlo Park, California
1973 - 1974	Part-time Lecturer Foothill College Los Altos, California

RESEARCH INTERESTS:

Application of statistical techniques to fishery and marine mammal biology: sampling scheme, estimation, prediction, and modeling, in particular related to fishery-independent sea surveys.

HONORS AND AWARDS:

Special service award: 1998
U.S. Department of Commerce Bronze Medal for Superior Federal Service, 1996
Best Publication awards: Best Publication for the Fishery Bulletin 1994
Promotion 1995
Quality Step Increase, 1990, 1996
Outstanding Performance Awards: 1981, 1984, 1986, 1989, and 1994
Superior Performance Awards: 1979, 1982, 1993

FORMAL TRAINING:

Career Seminar for Men and Women, Phase II, February 9-11, 1977
Leadership and Women, March 2-4, 1977
Technical Writing, July 19-22, 1977
The Supervisor and EEO, September 27-29, 1977
EEO - its place in the Federal Government, March 17-July 17, 1984
Assertiveness Training Workshop, April 9-16, 1984
Analysis of Survival Data, August 11-12, 1984
Time series analysis, UCSD, March-June, 1985
Leadership and supervisory skills for women, 1986
PC SAS BASICS workshop, September 25-27, 1989
Data analysis in S-Plus, NOAA custom course, April 23-30, 1999

PROFESSIONAL AFFILIATIONS:

American Statistical Association (ASA)
(ASA San Diego Chapter, Vice-Chair, 1986-91)

International Chinese Statistical Association (ICSA)
(the Executive Director of ICSA, 1995-1997, Board of Directors, 1998-2000)

American Fisheries Society

SERVICE ON SCIENTIFIC COMMITTEES:

Doctoral committee for Yanira A. Green Ruiz and Eva Coterio, CICESE, Ensenada, Mexico

TITLE OF DISSERTATION:

Performance of some tests for bivariate independence interchangeability and equality of distributions of ratios. (Ph.D. dissertation, Oregon State University, 1972)

A generalization of a scheduling algorithm (Master's report, Oregon State University, 1968)

PUBLICATIONS:

- Lo, N.C.H., J.R. Hunter, and J.H. Churnside. 1999. Modeling properties of airborne lidar surveys for epipelagic fish. SWFSC Admin. Rep., La Jolla, LJ-99-01, 48 p.
- Hill, K.T. M. Yaremko, L.D. Jacobson, N.C.H. Lo and D.A. Hanan. 1998. Stock assessment and management recommendations for Pacific sardine (*Sardinops sagax*) in 1997. Calif. Dep. Fish Game, Marine Region Admin. Rep. 98-5, 53p.
- Lo, N.C.H. 1997. Empirical analyses of the precision of regression estimates of daily egg production and egg mortality of pelagic fish for daily egg production method. *Ozeanografika* 2:71-89.
- Hunter, J.R. and N.C.H. Lo. 1997. The daily egg production method of biomass estimation: some problems and potential improvements. *Ozeanografika* 2:41-69.
- Polachek, T., E. Pikitch, and N. Lo. 1997. Evaluation and recommendations for the use of aerial surveys in the assessment of Atlantic bluefin tuna. SCRS/97/73. The International Commission for the Conservation of Atlantic Tuna (ICCAT), Standing Committee on Research and Statistics
- Pertierra, J.P., J. Lleonart and N.C.H. Lo. 1997. Application of a stage-specific matrix model and length-cohort based analysis to assess the anchovy fishery in Catalan coastal waters (NW Mediterranean Sea). *Fish. Res.* 30(1997):127-137.
- Moser, H.G., N.C.H. Lo, and P.E. Smith. 1997. Vertical distribution of Pacific hake eggs in relation to stage of development and temperature. *Calif. Coop. Oceanic Fish. Invest. Rep.* 38:120-126
- Lo, N.C.H, D. Griffith, and J.R. Hunter. 1997. Using a restricted adaptive cluster sampling to estimate Pacific hake larval abundance. *Calif. Coop. Oceanic Fish. Invest. Rep.* 38:103-113.
- Barnes, J.T., M. Yaremko, L. Jacobson, N.C.H. Lo and J. Stehly. 1997. Status of the Pacific Sardine (*Sardinops sagax*) resource in 1996. U.S. Dep. Commer., NOAA Tech. Memo., NOAA-TM-NMFS-SWFSC-237, 52 p.
- Fletcher, W.J., N.C.H. Lo, E.A. Hayes, R.J. Tregonning and S.J. Blight. 1996. Use of the daily egg production method to estimate the stock size of Western Australian Sardines (*Sardinops sagax*). *Mar. Freshwater Res.* 47:819-825.

- Lo, N.C.H., Y.A. Green Ruiz, M.J. Cervantes, H.G. Moser, R.J. Lynn. 1996. Egg production and spawning biomass of Pacific sardine (*Sardinops sagax*) in 1994, determined by the daily egg production method. Calif. Coop. Oceanic Fish. Invest. Rep. 37:160-174.
- Bentley, P.J., R.L. Emmett, N.C.H. Lo, and H.G. Moser. 1996. Egg production of Pacific sardine (*Sardinops sagax*) off Oregon in 1994. Calif. Coop. Oceanic Fish. Invest. Rep. 37:193-200.
- Lo, N.C.H., P.E. Smith and J. Butler. 1995. Population growth of northern anchovy and Pacific sardine using stage-specific matrix models. Mar. Ecol. Prog. Ser. 127:15-26.
- Lo, N.C.H. 1994. Level of significance and power of two commonly used procedures for comparing mean values based on confidence intervals. Calif. Coop. Oceanic Fish. Invest. Rep. 35:246-253.
- Moser, H.G., R.L. Charter, P.E. Smith, N.C.H. Lo, D.A. Ambrose, C.A. Meyer, E.M. Sandknop, and W. Watson. 1994. Early life history of sablefish, *Anoplopoma fimbria*, off Washington, Oregon and California, with application to biomass estimation. Calif. Coop. Oceanic Fish. Invest. Rep. 35:144-159.
- Jacobson, L.D., N.C.H. Lo and J.T. Barnes. 1994. A biomass-based assessment model for northern anchovy, *Engraulis mordax*. Fish. Bull., U.S. 92(4):711-724.
- Jacobson, L.D. and N.C.H. Lo. 1994. Spawning biomass of the northern anchovy in 1994. SWFSC Admin. Rep., La Jolla, LJ-94-17, 13 p.
- Butler, J.L., P.E. Smith and N.C.H. Lo. 1993. The effect of natural variability of life-history parameters on anchovy and sardine population growth. Calif. Coop. Oceanic Fish. Invest. Rep. 34:104-111
- Hunter, J.R., N.C.H. Lo and L.A. Fuiman [co-editors]. 1993. Ichthyoplankton methods for estimating fish biomass. In Advances in the early life history of fishes. Bull. Mar. Sci. 53(2), 935 p.
- Lo, N.C.H., J.R. Hunter, H.G. Moser and P.E. Smith. 1993. A daily fecundity reduction method of biomass estimation with application to Dover sole *Microstomus pacificus*. Bull. Mar. Sci. 53(2):842-863.
- Jacobson, L.D. and N.C.H. Lo. 1993. Spawning biomass of the northern anchovy in 1993. SWFSC Admin. Rep., La Jolla, LJ-93-13, 41 p.
- Hunter, J.R. and N.C.H. Lo. 1993. Ichthyoplankton methods for estimating fish biomass

- introduction and terminology. Bull. Mar. Sci. 53(2):723-727.
- Theilacker, G.H., N.C.H. Lo and A.W. Townsend. 1993. An immunochemical approach to quantifying predation by euphausiids on the early stages of anchovy. Mar. Ecol. Prog. Ser. 92:35-50.
- Garcia, A., N. Perez, N.C. Lo, A. Lago de Lanzos and A. Sola. 1992. The egg production method applied to the spawning biomass estimation of sardine, *Sardina pilchardus* (Walb.), on the North Atlantic Spanish coast. Bol. Inst. Esp. Oceanogr. 8(1):123-138.
- Lo, N.C.H., L.D. Jacobson, J.L. Squire. 1992. Indices of relative abundance from fish spotter data based on delta-lognormal models. Can. J. fish. Aquat. Sci. 49(12):2515-2526.
- Smith, P.E., N.C.H. Lo and J.L. Butler. 1992. Life-stage duration and survival parameters as related to interdecadal population variability in Pacific Sardine. Calif. Coop. Oceanic Fish. Invest. Rep. 33:41-49.
- Jacobson, L.D. and N.C.H. Lo. 1992. Spawning biomass of the northern anchovy in 1992. SWFSC Admin. Rep., La Jolla, LJ-92-24, 71 p.
- Lo, N.C.H., J.R. Hunter, H.G. Moser, P.E. Smith and R.D. Methot. 1992. The daily fecundity reduction method: a new procedure for estimating adult fish biomass. ICES J. Mar. Sci. 49:209-215.
- Hunter, J.R., B.J. Macewicz, N.C.H. Lo and C.A. Kimbrell. 1992. Fecundity, spawning, and maturity of female Dover sole *Microstomus pacificus*, with an evaluation of assumptions and precision. Fish. Bull., U.S. 90:101-128.
- Perez, N., I. Figueiredo and N.C.H. Lo. 1992. Batch fecundity of *Sardina pilchardus* (Walb.) off the Atlantic Iberian coast. Bol. Inst. Esp. Oceanogr. 8(1):155-162.
- Henry, F. and N.C.H. Lo. 1992. Dover Sole. In California's living marine resources and their utilization, W.S. Leet, C. M. Dewees and C. W. Haugen, eds. Sea Grant Extension Publication UCSGEP-92-12:97-99.
- Jacobson, L.D. and N.C.H. Lo. 1991. Spawning biomass of the northern anchovy in 1991. SWFSC Admin. Rep., La Jolla, LJ-91-19, 53 p.
- Jacobson, L.D. and N.C.H. Lo. 1990. Spawning biomass of the northern anchovy in 1990. SWFSC Admin. Rep., La Jolla, LJ-90-20, 31 p.
- Chen, C.T., T.C. Leu, S.J. Joung, and N.C.H. Lo. 1990. Age and growth of the scalloped

hammerhead, *Sphyrna lewini*, in Northeastern Taiwan waters. Pac. Sci. 44(2):156-170.

- Owen, R.W., N.C.H. Lo, J.L. Butler, G.H. Theilacker, A. Alvarino, J.R. Hunter and Y. Watanabe. 1989. Spawning and survival patterns of larval northern anchovy, *Engraulis mordax*, in contrasting environments C a site-intensive study. Fish. Bull., U.S. 87(3):673-688.
- Lo, N.C.H., J.R. Hunter and R.P. Hewitt. 1989. Precision and bias of estimates of larval mortality. Fish. Bull., U.S. 87(3):399-416.
- Watanabe, Y. and N.C.H. Lo. 1989. Larval production and mortality of Pacific saury, *Cololabis saira*, in the northwestern Pacific Ocean. Fish. Bull., U.S. 87(3):601-613.
- Lo, N.C.H. and R.D. Methot. 1989. Spawning biomass of the northern anchovy in 1988. Calif. Coop. Oceanic Fish. Invest. Rep. 30:18-31
- Jacobson, L.D. and N.C.H. Lo. 1989. Spawning biomass of the northern anchovy in 1989. SWFC Admin. Rep., La Jolla, LJ-89-17, 26 p.
- Lo, N.C.H. 1989. Evaluation of the port sampling of the wet fish fishery. SWFC. Admin. Rep., La Jolla, #LJ-89-10, 58 p.
- Peterman, R.M., M.J. Bradford, N.C.H. Lo and R.D. Methot. 1988. Contribution of early life stages to interannual variability in recruitment of northern anchovy (*Engraulis mordax*). Can. J. Fish. Aquat. Sci. 45:8-16.
- Lo, N.C.H. 1988. Preliminary spawning biomass estimate of the northern anchovy in 1988. SWFC. Admin. Rep., La Jolla, #LJ-88-17, 15 p.
- Lo, N.C.H. 1987. Statistical methods in fishery biology (in Chinese) 87-01. National Taiwan College of Marine Science and Technology, 87 p.
- Lo, N.C.H. 1986. Modeling life-stage-specific instantaneous mortality rates, an application to northern anchovy, *Engraulis mordax*, eggs and larvae. Fish. Bull., U.S. 84(2):395-407.
- Lo, N.C.H., J. Alheit and B. Alegre. 1986. Fecundidad parcial de la sardina peruana (*Sardinops sagax*). Publicacion no. 28 de Procopa, Bol. Del Inst. Del Mar Del Peru 10(2):45-60.
- Lo, N.C.H. and T.D. Smith. 1986. Incidental mortality of dolphins in the eastern Tropical Pacific, 1959-1972. Fish. Bull., U.S. 4(1):27-34.
- Lo, N.C.H. 1985. Egg production of the central stock of northern anchovy, *Engraulis mordax*,

1951-1982. Fish. Bull., U.S. 83(2):137-150.

- Hewitt, R., G. Theilacker and N.C.H. Lo. 1985. Causes of mortality in young jack mackerel. Mar. Ecol. Prog. Ser. 26:1-10.
- Lo, N.C.H. 1985. A model for temperature-dependent anchovy egg development and an automated procedure for the assignment of age to staged eggs. In: R. Lasker (Ed.), An egg production method for estimating spawning biomass of pelagic fish: application to the northern anchovy (*Engraulis mordax*), p. 43-50. U.S. Dep. Commer., NOAA Tech. Rep. NMFS-36.
- Hunter, J.R., N.C.H. Lo and R.J.H. Leong. 1985. Batch fecundity in multiple spawning fishes. In: R. Lasker (ed.), An egg production method for estimating spawning biomass of pelagic fish: Application to the northern anchovy (*Engraulis mordax*), p. 67-77. U.S. Dep. Commer., NOAA Tech. Rep. NMFS-36.
- Hewitt, R., A. Bindman and N. Lo. 1984. Procedure for calculating the egg production estimate of spawning biomass. SWFC Admin. Rep., La Jolla, LJ-84-19, 46 p.
- Smith, T.D. and N.C.H. Lo. 1983. Some data on dolphin mortality in the Eastern Tropical Pacific tuna purse seine fishery prior to 1970. NOAA-TM-NMFS-SWFC-34, 26 p.
- Lo, N.C.H. 1983. Sample size for estimating dolphin mortality associated with the tuna fishery. J. Wildlife Mgmt. 47(2):413-421.
- Lo, N.C.H. 1983. Re-examination of three parameters associated with anchovy egg and larval abundance: temperature dependent incubation time, yolk-sac growth rate and egg and larval retention in mesh nets. U.S. Dep. Commer., NOAA-TM-NMFS-SWFC-31, 33 p.
- Lo, N.C.H., J.E. Powers and B.E. Wahlen. 1982. Estimating and monitoring incidental dolphin mortality in the eastern tropical Pacific tuna purse seine fishery. Fish. Bull., U.S. 80(2):396-401.
- Perrin, W.F., N.C.H. Lo, and B. Wahlen. 1979. Progress in reducing the incidental kill of dolphins in the U.S. tuna purse-seine fishery in the eastern tropical Pacific. SWFC Admin. Rep., La Jolla, LJ-79-17, 3 p.
- Powers, J., N.C.H. Lo, and B. Wahlen. 1979. A statistical analysis of effectiveness of porpoise rescue procedures in reducing incidental mortality. NMFS, SWFC Admin. Rep., La Jolla, #LJ-79-7.
- Lo, N.C.H. 1978. California ocean shrimp mesh experiment. Calif. Fish and Game 64(4):280-301.

Lo, N.C.H. 1977. Notes on statistical concepts and application of statistical techniques to fishery biology. Cal. Dept. Fish and Game. Reference no.77-1, 116 p.

Everett, J. and N.C.H. Lo. 1976. The incidental kill of porpoise during the first half of 1976, the date of reaching the quota and the methodologies utilized in each estimation. NMFS, SWFC Admin. Rep., La Jolla, #LJ-76-37, 29 p.

Ferguson, N. Lo and D. Thomas. 1974. Some tests for independence. Aust. J. Stat. 16(1):11-19.

Ferguson, N. Lo. 1973. Comparison of three non-parametric tests for bivariate interchangeability. Aust. J. Stat. 15(3):191-209.

MANUSCRIPTS:

Lo, N.C.H. and J.R. Hunter, J. H. Churnside. Modeling properties of airborne LIDAR(light detecting and ranging)for epipelagic fish, submitted to Fish Bull., U.S.

Jing-Yong Kim and Nancy C.H. Lo. Production and mortality in embryonic stage and the seasonal spawning biomass of Pacific anchovy in the southern waters of Korea in 1983 - 1994.

Moser, et al. Dover sole early life history.

PUBLIC SPEAKING:

Incidental Catch: estimation and sampling procedures of porpoise mortality associated with yellowfin tuna fishery by U.S. purse seiners in ETP 1976- 1978, presented at American Institute of Fisheries Research Biologists : Stock Abundance Estimation Workshop, June, 1978.

Evaluation of porpoise regulation. SWFC seminar, 1980.

Egg Production of the central stock of northern anchovy (*Engraulis mordax*) 1951-1982, presented at California Cooperative Oceanic Fisheries Investigations (CalCOFI) annual conference, October, 1982.

_____ also presented at SWFC, 1982.

Modelling life-stage-specific instantaneous mortality rates for anchovy eggs and larvae, presented at American Statistical Association annual meeting, August, 1984.

_____ also presented at CalCOFI annual conference, October, 1984.

Use of statistics in anchovy fishery management on a real time basis, an invited paper presented at American Statistical Association annual meeting, August, 1985.

Simulation of precision and bias in assessment of larval fish in the sea, CalCOFI annual conference, October, 1985.

Taiwan fishery research and statistical development. SWFC seminar, 1986.

Two-week lectures on statistical methods for marine biology at Salt Research Institute, Tang Gu, China, August, 1987.

Lectures on Egg production method at Instituto Nacional de La Pesca, Mazatlan, Mexico, September, 1987.

Fishery sampling workshop at Instituto Nacional de La Pesca, Ensenada B.C.N. Mexico, October, 1988.

A new egg production method of biomass estimation with application to dover sole, *Microstomus pacificus*. 1988 at CalCOFI annual conference, Lake Arrowhead, CA.

_____ also presented at 1989 Groundfish Conference in Monterey, CA.

Application of a general linear model to assessment of relative population of northern anchovy using data collected by a airborne monitoring program. 1990 at CalCOFI annual conference, 1990 at Pacific

Grove, CA.

A daily reduction method with application to dover sole, *Microstomus pacificus*. Symposium for annual meeting of the early life history section of the American fisheries society. Los Angeles, June, 1991.

Variation of life stage duration and survival parameters as related to recruitment variability of schooling coastal pelagic fishes. ICES meetings at La Rochelle, France. September, 1991.

Short course on Stage based population models for pelagic fishes, Vigo, Spain. October, 1991.

Short course on Stage based population models for pelagic fishes, CICIMAR, La Paz, Mexico, December, 1991.

Seminar on stage-based population models for pelagic fishes, CICESE, Ensenada, B.C.S. July 14, 1993.

Power of two commonly used procedures based on confidence interval for comparing mean values: A simulation study. Calcofi meetings. Nov 2-4, 1993.

How we count the fish from the air: An application of Delta-lognormal linear models. American Statistical Association, San Diego Chapter meeting. October 8th, 1993

_____ Statistics Department, U.C. Riverside. Nov 30, 1993

Some statistical considerations of using light detecting and ranging (LIDAR) technology to assess biomass of epipelagic fish. Stock assessment workshop, NMFS. August 10-12, 1994, Seattle, WA.

_____, CalCOFI meeting at Lake Tahoe, CA., October, 1994.

Some statistical issues of using daily egg production method to estimate spawning biomass of pelagic fishes. An invited talk for a workshop on ichthyoplankton research for fisheries science: Fishery-free methods for estimation of population size and extent. International Larval Fish Conference. June, 1995, Sydney, Australia.

Invited speaker for a workshop on "Improvements of the methodology of anchovy DEPM surveys" by Instituto Tecnológico Presquero y Alimentario, Basque Country, Spain, October, 1995.

Invited speaker for a workshop on "Improvements of the methodology of anchovy DEPM surveys" by Chile, Dec. 1996

Invited participant for a workshop on »Statistical methods for estimating incidental takes of sea turtles and seabirds in longline fisheries« by NMFS Honolulu laboratory, Hawaii. April 15-17, 1998.

Invited speaker for Spatial statistics in the Great Lakes- Quantifying Distribution patterns, The 41st conference of the International Association for Great Lakes Research, May 18 - 22, 1998. MacMaster University Hamilton, Ontario.

Invited speaker for network and adaptive sampling- Theory and application. August 9-13, 1998. The joint statistical meetings, Dallas, Texas.

Invited speaker for the symposium on fishery assessment using remote sensing techniques. August 23 - 27, 1998. American Fisheries Society, 128th Annual meeting. Hartford, Connecticut.

Invited speaker of Underway sampling workshop. California Cooperative Oceanic fisheries investigations, Annual conference. 4 - 6 November, 1998. Asilomar Conference Center, Pacific Grove. Ca.

Using egg pump and CalVET to estimate the daily egg production of Pacific sardine off California. California Cooperative Oceanic fisheries investigations, Annual conference. 4 - 6 November, 1998. Asilomar Conference Center, Pacific Grove. Ca.